DOCUMENT RESUME

ED 241 592 TM 840 143

AUTHOR Raphael, Taffy E.
TITLE Developmental Aspects of Training Students to Use Information-Locating Strategies for Responding to Questions. Research Series No. 137.
INSTITUTION Michigan State Univ., East Lansing. Inst. for Research on Teaching.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE Nov 83
CONTRACT 400-81-0014
NOTE 30p.; Paper combines data presented at the Annual Meeting of the American Educational Research Association (Montreal, Canada, April 1983) and the meeting of the Society for Research in Child Development (Detroit, Michigan, April 1983).
AVAILABLE FROM Institute for Research on Teaching, College of Education, Michigan State University, 252 Erickson Hall, East Lansing, MI 48824 ($3.00).
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Age Differences; Elementary Education; Individual Development; *Individual Differences; Intentional Learning; *Reading Comprehension; Reading Improvement; *Reading Instruction; *Reading Strategies; *Reading Tests; Textbook Content

ABSTRACT

This technical report describes a series of three studies designed to instruct students in the relationship between texts, comprehension questions, and two sources of answer information--the text to which a given question refers and their own background knowledge. The focus of the technical report is on individual differences in the amount and type of instruction most beneficial to students from fourth through eighth grade. The studies demonstrated that for the younger students, a longer (i.e., 6-8 week) instructional program was necessary, with gradually decreasing amounts of instructional time required as the students' age level increased. The studies also represent a continuum in instructional research that begins with a training study conducted in classrooms by a university researcher, and moves to instructional studies implemented by classroom teachers in their own classrooms. (Author/PN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED241592

Research Series No. 137

DEVELOPMENTAL ASPECTS OF TRAINING STUDENTS TO USE INFORMATION-LOCATING STRATEGIES FOR RESPONDING TO QUESTIONS

Taffy E. Raphael

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

T. Raphael

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Institute for Research on Teaching

College of Education — Michigan State University

MSU is an Affirmative Action/Equal Opportunity Institution

Research Series No. 137

DEVELOPMENTAL ASPECTS OF TRAINING STUDENTS TO USE INFORMATION-LOCATING STRATEGIES FOR RESPONDING TO QUESTIONS

Taffy E. Raphael

Published By

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, Michigan 48824-1034

November 1983

This work is sponsored in part by the Institute for Research on Teaching, College of Education, Michigan State University. The Institute for Research on Teaching is funded primarily by the Program for Teaching and Instruction of the National Institute of Education, United States Department of Education. The opinions expressed in this publication do not necessarily reflect the position, policy, or endorsement of the National Institute of Education. (Contract No. 400-81-0014)

Institute for Research on Teaching

The **Institute for Research on Teaching** was founded at Michigan State University in 1976 by the National Institute of Education. Following a nationwide competition in 1981, the NIE awarded a second contract to the IRT, extending work through 1984. Funding is also received from other agencies and foundations for individual research projects.

The IRT conducts major research projects aimed at improving classroom teaching, including studies of classroom management strategies, student socialization, the diagnosis and remediation of reading difficulties, and teacher education. IRT researchers are also examining the teaching of specific school subjects such as reading, writing, general mathematics, and science, and are seeking to understand how factors outside the classroom affect teacher decision making.

Researchers from such diverse disciplines as educational psychology, anthropology, sociology, and philosophy cooperate in conducting IRT research. They join forces with public school teachers, who work at the IRT as half-time collaborators in research, helping to design and plan studies, collect data, analyze and interpret results, and disseminate findings.

The IRT publishes research reports, occasional papers, conference proceedings, a newsletter for practitioners, and lists and catalogs of IRT publications. For more information, to receive a list or catalog, and/or to be placed on the IRT mailing list to receive the newsletter, please write to the IRT Editor, Institute for Research on Teaching, 252 Erickson Hall, Michigan State University, East Lansing, Michigan 48824-1034.

Co-Directors: Jere E. Brophy and Andrew C. Porter

Associate Directors: Judith E. Lanier and Richard S. Prawat

Editorial Staff
Editor: Janet Eaton
Assistant Editor: Patricia Nischan

Abstract

This technical report describes a series of three studies designed to instruct students in the relationship between texts, comprehension questions, and two sources of answer information--the text to which a given question refers and their own background knowledge. The focus of the technical report is on individual differences in the amount and type of instruction most beneficial to students from fourth through eighth grade. The studies demonstrated that for the younger students, a longer (i.e., 6-8 week) instructional program was necessary, with gradually decreasing amounts of instructional time required as the students' age level increased. The studies also represent a continuum in instructional research that begins with a training study--in which instruction was conducted in classrooms by a university researcher--and moves to instructional studies--in which the training program was implemented by classroom teachers in their own classrooms.

DEVELOPMENTAL ASPECTS OF TRAINING STUDENTS TO USE INFORMATION-LOCATING STRATEGIES FOR RESPONDING TO QUESTIONS[1]

Taffy E. Raphael[2]

Students spend a great deal of their day in question-answer exchanges with their teacher, one of the most common of which is answering comprehension questions after reading stories and texts. The ability to answer these questions is often the means by which students are labeled skilled or unskilled readers. Research (Garner, Wagoner, & Smith, 1983; Raphael, Winograd, & Pearson, 1980) has suggested that less skilled readers do not have clear strategies for answering comprehension questions. It is obvious that the ability to answer a comprehension question will depend largely on whether or not the student has the appropriate information available. One less obvious, but perhaps equally important factor is students' knowledge of the sources of information on which they can draw. These sources may be internal (in the readers' knowledge base) or external (in the text or other outside sources). Knowing where such information sources are may be fundamental to the skillful answering of comprehension questions.

---

[1]This paper combines data presented at the Montreal meeting of the American Educational Research Association and the Detroit meeting of the Society for Research in Child Development, April, 1983. Separate manuscripts detailing the methodology and results of each of the three studies included in this article are available and can be obtained by writing to the author at 446 Erickson Hall, MSU, East Lansing, MI 48824-1034.

[2]Taffy E. Raphael is an assistant professor in the Departments of Counseling, Educational Psychology, and Special Education and of Teacher Education in MSU's College of Education.

One aspect of developing successful strategies for answering questions is students' ability to detect the contingent relationship between finding an appropriate answer, which is the goal of a question, and the various means by which the goal can be reached. The more explicit the question and the answer (i.e., words that make up the question and words used to answer it both can be easily found in a single sentence of text), and more likely the student will be to deduce both the relationship between a question, its answer-information source, and the more general procedural knowledge that characterizes question answering. In questions with less clearly defined answers (i.e., the question requires the reader to integrate several sentences in order to answer it appropriately), it would be more difficult to deduce this relationship. Since the relationship between the various means and goals in answering questions is not always obvious, it is likely that the development of an awareness of this relationship can be enhanced through the processes of mediation and instruction. The idea that children's cognitive activities are initially mediated by social others has longstanding and widespread theoretical support (Mead, 1934; Rosenthal & Zimmerman, 1978; Vygotsky, 1978; Wertsch, 1977).

This paper describes a series of three studies (Raphael & Pearson, 1982; Raphael, Wonnacott & Pearson, 1983; Raphael & McKinney, in press) designed to test whether heightening students' awareness of sources of information through the mediation of an instructor would enhance their comprehension of text as measured by their ability to answer comprehension questions.[3] The mediator provided a support structure around the question-answering task. This was

---

[3]These studies are published in their entirety as listed above. Pilot studies referred to in this paper (e.g., when testing materials) were part of the Raphael & Pearson (1982) study.

then gradually removed as students' need for such support diminished. Across this series of studies, my colleagues and I have examined the usefulness of instruction both developmentally and across ability levels. The studies range from an initial set of training studies in which the intervention was conducted by an educational researcher, to instructional studies in which the intervention was introduced by classroom teachers as part of their developmental reading program. In describing this series of studies, evidence will be presented suggesting that the need for mediation varies with developmental level and question goals.

Experiment 1: Training Sixth Grade Students

Because the same training materials, method of instruction, and dependent measures developed for the first study were used, with minor change, throughout this experimental series, they will be described in some detail here. The purpose of this first study was to test the efficacy, for sixth-grade students, of a three-day intervention concerning sources of information for answering comprehension questions.

Method

Subjects. Fifty-nine sixth-grade students whose ability level had been determined through a combination of standardized tests and teacher judgment were randomly assigned to either a training or control group. There were 10 subjects per ability level, with the exception of the low ability control group which had only 9. An analysis of variance (ANOVA) revealed no significant differences within ability levels (high, average, and low).

Materials. All materials in this series of studies were based upon a three-category taxonomy of questions proposed by Pearson and Johnson (1978).

This taxonomy is unique in that it classifies questions in relation to the sources of information used in answering them. If a question has an answer explicitly stated in the text, its question-answer relationship is text-explicit. A question with an answer in the text that requires integration of information across sentences or paragraphs has a text-implicit, question-answer relationship. A question with an answer not in the text, but only from the readers' knowledge base is a script-implicit, question-answer relationship. The mnemonics Right There, Think & Search, and On My Own were used as respective categories when working with the elementary and middle school students.

Three booklets were developed to use during training, one per day. The first booklet was designed to introduce students to question-answer relationships. Based upon the concepts of shaping and fading (Hill, 1981), the booklets began by providing a great deal of support for identifying the goals of questions and appropriate information for reaching these goals. First, brief texts (75-150 words), each followed by one question from each question-answer relationship category, were presented sequentially. The following were provided for each question: the answer, the question-answer relationship, and the reason for the relationship. The next set of examples also included passages, questions, answers, and question-answer relationships for each question and answer, but the students had to provide the reason for the question-answer relationship. The next set of examples included passages, questions, and answers, and students provided the question-answer relationship and the reason for it. Finally, students were presented with a series of passages and comprehension questions, but had to provide an answer and the question-answer relationship represented using the following format, called the question-answer relationship task.

What are three types of research oceanographers?

Right There _____

Think & Search _____

On My Own _____

Students wrote their answers on the line next to the question-answer relationship they felt the question and answer represented.

The first booklet reflected this gradually decreasing support. The second and third booklets provided practice applying knowledge about question-answer relationships to longer and more difficult passages adapted from naturally occurring texts, with more reliance on independent work, as feedback became increasingly intermittant.

Four passages were used, and each student read two. One was a passage read by all students, one was from a set of three passages including one passage each at the fourth- and eighth-grade levels, and a filler passage that was not analyzed. In this way, students could be compared when reading a common passage or when reading a passage at their reading level.

Design. A 3 x 2 x 3 randomized block design was used with between-subjects factors of ability and treatment and a within-subjects factor of question-answer relationship.

Procedure. Students in the trained group received three days of instruction. On Day 1, students were introduced to question-answer relationships in groups, with the author providing definitions and visual representations to help make clear the three question-answer-relationship concepts. Students were then led through the phases of the first booklet as described above. They received feedback on a group or individual basis, depending upon the activity, focusing on their explanation accuracy, their ability to recognize

the correct question-answer relationship when provided with a question and answer, the completeness and accuracy of their answers when provided with only the question, and the consistency between their question-answer-relationship selection and the source of information for their answer (e.g., if an On-My-Own question-answer relationship was selected, students' answers were from their knowledge base, and they answered the question well). On the second day, students worked through the second booklet, which consisted of longer passages and more questions per passage. The first passage was read orally by the instructor and students answered questions as a group. Following this, students worked through the remainder of the questions on their own while the instructor gave individual feedback on question-answer-relationship selection and accuracy of answers. On the third day, students practiced with a full-length passage divided into four segments, each followed by six questions (two from each question-answer-relationship category), which represented a typical basal reader story or content-area chapter. Students did the first segment individually, then corrected the segments together in the larger group. The last three segments were completed individually and served as a criterion test. A fourth day had been set aside for individually tutoring those who had not reached a 75% accuracy level in question-answer-relationship identifications, but all students were successful. The fifth day involved the experimental test.

Students in both training and control groups were tested on the same day, each responding to a common passage and related questions and to a passage appropriate to their grade level. Story order was counterbalanced. For trained students, only directions to read the passage and answer the questions by writing answers on the blank next to the question-answer relationship represented were provided. Control-group students received an explanation of

definitions of the three question-answer relationships, were reminded that some of the answers would not be found in their texts, and then practiced identifying question-answer relationships on two brief texts with related questions. Then they too were asked to read the passages and answer the questions on the blank next to the appropriate question-answer relationship. This introduction, used in pilot studies (see Raphael & Pearson, 1982), had been found to be sufficient for skilled adult readers to complete the task with 98% accuracy and was considered to be the minimum necessary to provide an adequate control group capable of responding to the question-answer-relationship task.

Results

Three dependent measures were used to assess performance levels. The first, *hits*, identified the number of correct question-answer-relationship identifications (e.g., Right There for a text-explicit, question-answer relationship). This was a measure of the students' sensitivity to the task demands of a question. The second, *response quality*, examined the quality of the students' answers (e.g., complete and correct, partial and correct, incorrect). This was a measure of the degree to which knowledge of information sources for answering comprehension questions influenced the quality of students' answers. The third, *matches*, indicated the degree of agreement between question-answer-relationship identification and probable source of answer information (e.g., correctly identifying Right There when the information for answering the question was explicitly stated in text). To create this measure, I established a matrix whereby students received a point for each case in which they correctly or incorrectly answered Right There or Think & Search for text-based questions. Similarly, I gave credit for each case in which students answered (correctly or not) from their knowledge base for a question

they had labeled On My Own. This matrix indicated the degree to which students had internalized the knowledge about question-answer relationships. With it, I considered the question, "Did the students do what they indicated they should do?"

Based on the three dependent measures, two 3 x 2 x 3 multivariate analyses of variance (MANOVA) were performed, one each for the common passage and the reading-level passage set. The between-subjects factors were ability (high, average, and low) and condition (trained and control), while the within-subjects factor of question-answer relationship was partialed into two a priori contrasts using Helmert's contrasts in the multivariate procedures described in Bock (1975). Question-Answer Relationship 1 contrasted performances on explicit and the average of the two implicit question-answer relationships, while Question-Answer Relationship 2 contrasted performances on text- and script-implicit, question-answer relationships. The Wilk's lambda multivariate test of significance was used, followed by Roy-Bargman univariate step-down F-tests, where indicated.

On the common-passage comparisons, there were significant multivariate effects for ability, condition, and Question-Answer Relationship 2, all of which were involved in a significant three-way interaction. The multivariate difference for Question-Answer Relationship 1 could be accounted for by chance alone, as was the case for the three two-way interactions. The follow-up examinations were performed, first on the significant interaction, then on the significant main effects.

The effect for the significant interaction could be attributed solely to differences on the measure of response quality, $F(2,52) = 8.77$, $p < .01$ (see Figure 1). Performance of students of high ability varied as a function of training only on the script-implicit questions, with the high ability, trained

students scoring at higher levels than did the control-group students, but not differing as a function of training on either text-based question-answer relationship. In contrast, trained students of average and low ability levels differed from their respective control-group students on text-based question-answer relationships only, showing no differences on script-implicit questions. Finally, disparity between trained and control-group students increased as ability level decreased.

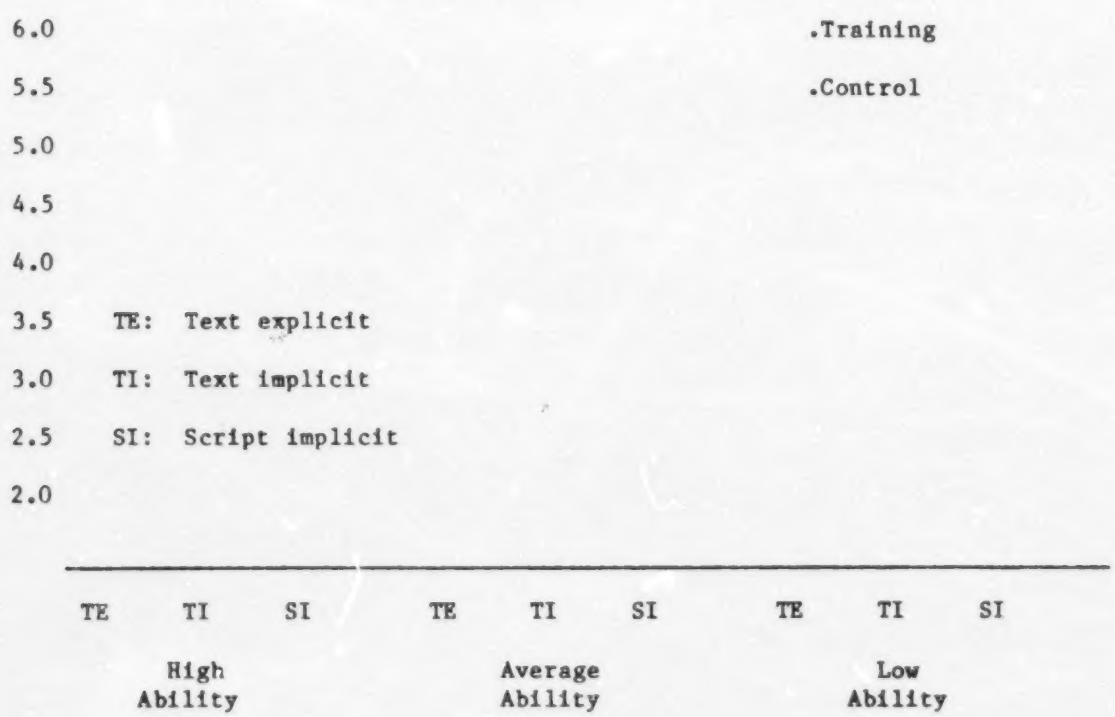

Figure 1. Response quality on repeated measures on MANOVA: ability x condition x question-answer relationship.

In addition, trained students demonstrated greater sensitivity to task demands of questions (as measured by hits) and greater consistency between

their information source identification and answer information source (matches) (see Table 1).

While the reading-level passage-set analysis revealed no multivariate effects for condition, trends in the means were similar to those in the common passage, particularly in measures of sensitivity and consistency (see Table 1).

Experiment 2: Training Fourth-Grade Students

The second experiment consisted of two studies. The first, a training study, was designed to replicate the findings for sixth graders with a younger population. The second was an instructional study designed to both extend the training period and to implement these procedures as a part of the students on-going developmental reading program. The studies will be described separately as 2a and 2b.

Experiment 2a: A Fourth-Grade Training Study

Method

Subjects. Twenty average fourth-grade students from three classrooms were randomly assigned to the training or control group. Analysis of variance using standardized reading comprehension scores revealed no significant differences between the two groups.

Materials. The three booklets developed for Experiment 1 were used with minor changes in the passages so that none were above the fourth-grade reading level. Two test passages at the fourth-grade level with six questions from each question-answer relationship category were developed for use in testing.

Table 1

Training and Control Group Means for Hits, Response Quality, and Matches

Experiment I

	Hits		Response Quality		Matches	
	CP[a]	LAPS[b]	CP	LAPS	CP	LAPS
Ability	$F(2,53)=10.36^{**}$	$F(2,53)=10.16^{**}$	$F(2,53)=19.38^{**}$	$F(2,53)=4.22^{*}$	$F(2,53)=7.55^{**}$	$F(2,53)=3.56^{*}$
High	4.26	4.44	5.46	5.22	5.22	5.34
Average	3.60	3.60	4.62	4.62	5.04	5.04
Low	3.00	3.42	3.60	4.74	4.26	4.68
Condition	$F(1,53)=12.56^{**}$	$F(1,53)=3.99^{*}$	$F(1,53)=3.99^{*}$	$F(1,53)=6.21^{*}$	$F(1,53)=13.60^{*}$	$F(1,53)=5.11^{*}$
Trained	4.02	4.08	4.80	5.10	5.28	5.16
Control	3.00	3.60	4.32	4.62	4.44	4.80
QAR[c] (1)	$F(1,53)=1.15$	$F(1,53)=4.60^{*}$	$F(1,53)=.26$	$F(1,53)=11.24^{**}$	$F(1,53)=6.73^{**}$	$F(1,53)=10.54^{**}$
(2)	$F(1,53)=.10$	$F(1,53)=5.60^{*}$	$F(1,53)=75.79^{**}$	$F(1,53)=31.21^{**}$	$F(1,53)=28.46^{**}$	$F(1,53)=15.35^{**}$
Text Explicit	3.45	4.14	4.62	5.16	5.10	5.28
Text Implicit	3.60	3.36	5.10	5.16	5.22	5.16
Script Implicit	3.53	3.96	3.96	4.26	4.26	4.50

[a]CP = Common passage
[b]LAPS = Level appropriate passage set
[c]Question-answer relationship (1) explicit versus implicit and (2) text versus script

$^{*}p < .05$
$^{**}p < .01$

Design and procedures. A 2 x 3 randomized block design was used with the between-subjects factor of treatment (training and control) and the within subjects factor of question-answer relationship (text explicit, text implicit, and script implicit). Procedures were identical to those used in Experiment 1.

Results. Though it had been sufficient for the sixth graders, the three-day intervention did not appear to be sufficient for the fourth graders. There were no significant differences between students in the trained and those in the control group. To determine if the amount of mediation was the critical difference in the needs of these younger students, a second study of fourth-graders was conducted.

Experiment 2b: A Fourth-Grade Instructional Study

The purpose of this study was three-fold. First, I extended the length of the intervention to include an eight-week maintenance program, testing the effects of the longer training program when taught as part of an on-going developmental reading program. Second, I tested the effects of training in a transfer condition in which a passage about dinosaurs--made to look like the science materials the students typically used--was distributed to teachers when students were not in school. The materials made no mention of the question-answer relationships, nor were the questions followed by the question-answer relationship task. Teachers administered the materials stating that they were beginning a unit on dinosaurs and the students were to read the passage to themselves and answer the questions. Third, the possibility that enhanced performance after the intervention could be explained solely in terms of practice effects had not been eliminated in previous studies, so I included a practice/training contrast in this experiment.

Method

Subjects. Participating in the study were 10 fourth-grade teachers and 180 of their students from a semi-rural western community. Six of the teachers instructed students in two treatment groups, while four of the teachers instructed students in two control groups. The participating students were selected within schools from a population of 280 in three comparable elementary schools (two training, one control school). To insure that the randomization used in the subject selection process had resulted in equivalent groups, an analysis of variance was performed on the reading comprehension scores, revealing a significantly higher performance of the two control groups (no-treatment control and practice) compared to the trained students. Analyses of covariance were used when comparisons across these groups were performed with the ITBS[3] reading comprehension score as the covariate.

Materials. Training materials were the same as in the previous study except for the addition of a second set of materials consisting of eight passages, each approximately 250 words in length and at a late third-grade reading level, with six corresponding questions, two from each question-answer relationship category. These were the maintenance passages used once weekly following the intensive training week.

Four passages of 600-800 words each were used (two from the previous study of fourth graders) on topics rated in pilot studies as being familiar to fourth-grade students (e.g., dogs, clowns). The passages were created by making minor revisions to naturally occurring passages from trade books and

---

[3]ITBS stands for Iowa Test of Basic Skills.

basal readers. Each passage was accompanied by 18 related comprehension questions, 6 each from the text-explicit, text-implicit, and script-implicit categories.

Procedures: training group. Six teachers received a half-day inservice involving instruction in the three question-answer relationships, demonstration of the materials that could be used to instruct the students, and modeling of how the instruction should proceed. Half of the teachers received materials, and I made weekly visits to monitor their lessons and their students' progress. The other half of the teachers did not receive materials but were taught how to create them from naturally occurring texts. They received weekly visits but were not observed and received no specific feedback. However, the differences in performance of those students whose teachers had received intervention and those who had not were minnor and will not be presented here. Following the inservice, teachers implemented the intervention for nine weeks, at the end of which students were tested under a transfer and a maintenance condition. Recall that in the transfer condition teachers administered the test passage with its corresponding questions without mentioning question-answer relationships or the training program. In the maintenance condition, I administered a test passage with corresponding questions followed by the question-answer relationship task with directions to complete the work in the way they had been practicing during their question-answer relationship lessons.

Procedure: Control Group 1--practice. Since significantly higher performance by students trained in question-answer relationships could be attributed to their systematic exposure to questions from each of the three question-answer relationship categories, a practice-only control group was

included. This group received all passages and questions received by training-group students, but received no question-answer relationship training. The students then participated in the testing period, which occurred at the end of the extensive training in the treatment groups. They were given both the transfer and the maintenance passages, but neither passage included the question-answer relationship task.

Procedure: Control Group 2--no treatment. This group of students participated in the same testing period as the treatment groups, received the two passages--maintenance and transfer--in the same form as the other control group, and were not exposed in any way to question-answer relationships or to practice on the question-answer relationship materials.

Results: Practice/training contrast. Analyses of the students' response quality on both passages revealed no significant differences between the control group and the practice-only group. Apparently, differences in performance among students trained in question-answer relationships cannot be predicted on the basis of practice alone. Therefore, for all subsequent analyses, these groups were collapsed and treated as a single control group.

Results of transfer test. A condition (Training 1, Training 2, and Control) x ability (high, average, and low) x question-answer relationship (text explicit, text implicit, and script implicit) analyses of covariance revealed a condition x ability interaction, F (4,124) 2.44, $p < .05$, (see Figure 2) in which training effects were greater as reading ability decreased, replicating effects in the study of sixth graders.

Results of maintenance test. There were no significant differences on the maintenance test, which raised a question about the presence of the

question-answer-relationship task. In the study of sixth graders, both groups had used these prompts, and differences in performance favored the trained students. In this study on the transfer test, neither group had the prompts, and, again, differences favored the trained students. Yet, when the trained students used the task, and the control students did not, there were no differences. Therefore, one must question whether the two groups might, in this case, actually be performing two different tasks. The trained students were overtly identifying question-answer relationships and answering the questions; the control students were only answering questions. A question raised for future study, then, is "Under what circumstances will prompting by the question-answer-relationship task not interfere with answering questions?"

Experiment 3: A Developmental Instructional Study in Training Students to Recognize Different Sources of Information

Since it was apparent that needs for mediation varied between fourth and sixth graders, a developmental study with second, fifth, and eighth graders was conducted. However, only the data for fifth and eighth grade will be reported. The data for second grade had to be discarded for two reasons: (1) teachers had to change the training format from predominately written to oral since students had difficulty with the amount of silent reading, (2) students were not able to write their answers to open-ended questions due, probably, to the small amount of writing practice experienced in other classroom settings. To assess for possible effects, we did test the students after training using a multiple-choice format administered by their teachers, but this separate analysis of the data revealed no differences. Anecdotal data suggest that because of the amount of teacher assistance and students assisting each other these findings may not be valid. Hence, the study reported below can be regarded as an instructional study conducted at two grade levels, with question-

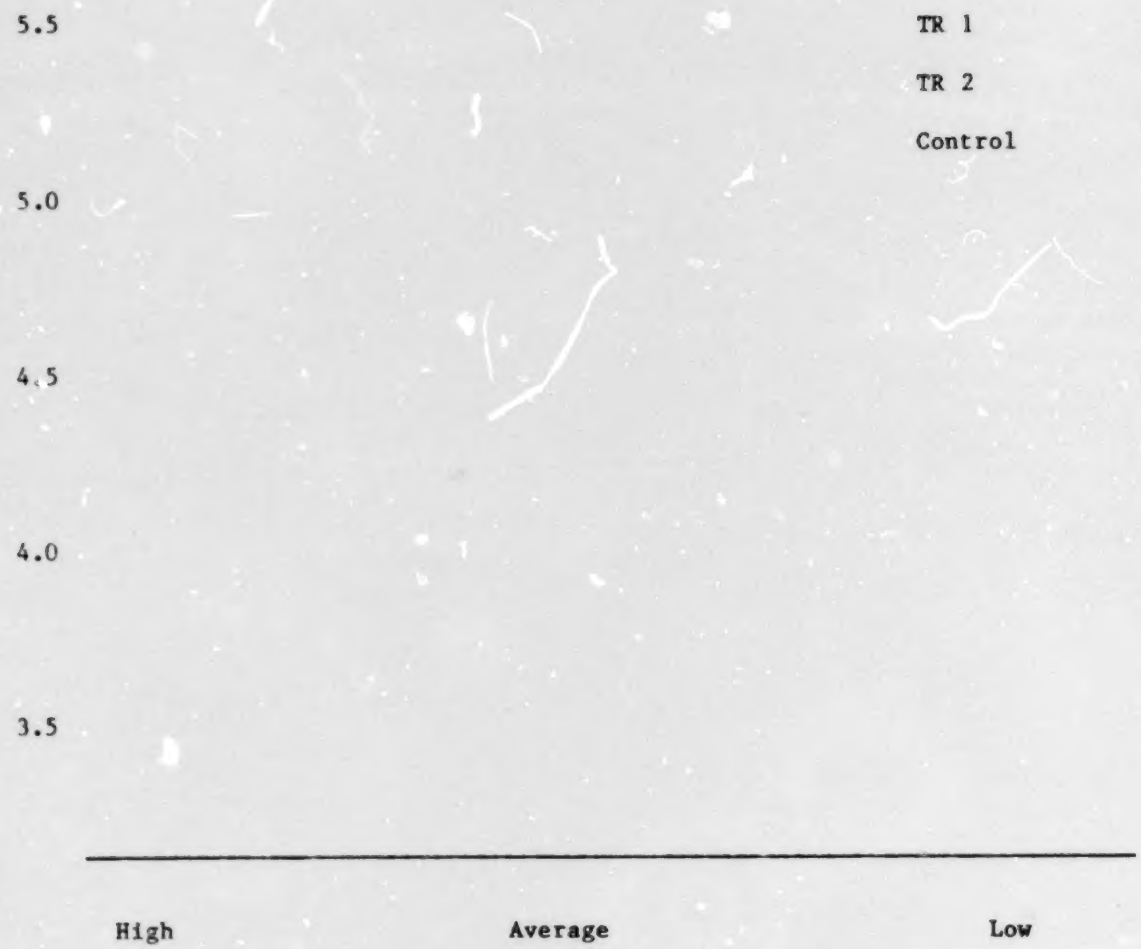

Figure 2. Response quality on repeated measures of analysis of covariance: ability x condition, Experiment 2.

answer-relationship training implemented as part of ongoing developmental and English programs in fifth and eighth grades. My purpose was to examine developmental differences in a single experiment. Given that different levels of training were indicated by the previous studies, with more mediation required by the younger students, I predicted that students in the upper grades would require less than the three-day training period required in sixth grade. A second question concerned the developmental differences in using the question-answer relationship task.

Method

Subjects. Participating in this study were 112 fifth and 115 eighth graders from four comparable suburban schools. Student ability was determined by a combination of standardized test scores and by teacher judgment, and students were assigned to treatment within schools by classrooms. Group sizes ranged from 13 to 22. Analysis of variance revealed no significant differences related to student ability.

Materials. Based upon the teacher input from the instructional study of fourth graders, all teachers, who participated in an inservice in which they learned how to teach QARs to their students, received the three booklets to use with their students. In addition, they received six maintenance passages. These training materials were at the grade level of the participating students and were identical in format to those used in my previous studies. Three test passages with parallel fifth- and eighth-grade versions were created by modifying previous test passages.

Procedures. Three stages occurred in this study: (1) teacher inservice of the type received by Training Group 1 in the study of fourth graders, (2)

eight weeks in which participating teachers who had received the inservice used the first two weeks to have the students complete the training booklets and the last six to complete the maintenance passages, (3) testing over two days, the first of which involved students reading a passage without the question-answer-relationship task to cue them to the three types, and the second of which involved using the question-answer-relationship task. On the second day of testing, students in the control group received the orientation to question-answer relationships used for the control group in Experiment 1.

Results. Two analyses were performed on the dependent measures of hits, responses, and matches. The first was a univariate ANOVA using the response-quality dependent measure available from both test days. Thus, the following factors were present in the ANOVA: ability (high, average, and low), condition (training and control), grade (fifth and eighth), question-answer-relationship (text explicit, text implicit, and script implicit), and question-answer-relationship task (absence or presence). A second analysis conducted on the data available from the second day only was a multivariate ANOVA using the three dependent measures of hits, response quality, and matches. Results, which involved the factor of condition, will be discussed by the dependent measures, response quality, and hits. There were no significant differences on the dependent measure, matches.

Training condition was involved in three interactions, two from the ANOVA and one from the MANOVA. On the ANOVA, the condition x ability interaction revealed results consistent with previous studies: Training was more effective for students of lower ability levels ($\underline{M}$ Trained Average/Low = 4.03; $\underline{M}$ Control Average/Low = 3.83) than for higher ability students ($\underline{M}$ Trained = 4.72; $\underline{M}$ Control = 5.02). The significant, condition x grade x task interaction (see Figure 3) suggests that for the fifth graders, the presence of the

question-answer-relationship task enhanced the trained students' performance levels, while decreasing the performance levels of the control group students. In contrast, in the eight grade, the presence of the task decreased the trained students' performance levels and did not affect the performance levels of the control-group students. Perhaps the fifth-graders needed the extended practice before the task could serve as an aid. The reduction in the eighth graders' performance levels will be discussed below.

The third interaction on the MANOVA involved grade and condition and was parallel to the finding on the ANOVA described previously. In the fifth grade, the training groups' performance ($\underline{M}$ = 4.75) was higher than that of the control group ($\underline{M}$ = 3.76) when the question-answer-relationship task was used. In the eighth grade, the orientation appeared to be more effective ($\underline{M}$ Trained = 4.21; $\underline{M}$ Control = 4.65).

On the measure of sensitivity to task demands of questions, training condition interacted with both grade and question-answer relationship. The condition x grade interaction was due to the greater effect of training on the sensitivity of fifth graders ($\underline{M}$ Trained = 3.94; $\underline{M}$ control = 3.14) than on eighth graders ($\underline{M}$ Trained = 3.89; $\underline{M}$ Control = 3.71). Apparently, the 10-minute orientation was sufficient for enhancing eighth graders' sensitivity to task demands. If this is true, it is likely that having to continue practicing for six weeks created a problem in attitude. Anecdotal data from their teachers suggests that the eighth graders grew tired of answering questions when they also were required to label the question-answer relationships, a finding that may explain the reduced performance in response quality of the eighth graders when they used the question-answer-relationship task. The condition x question-answer-relationship interaction suggests that training was

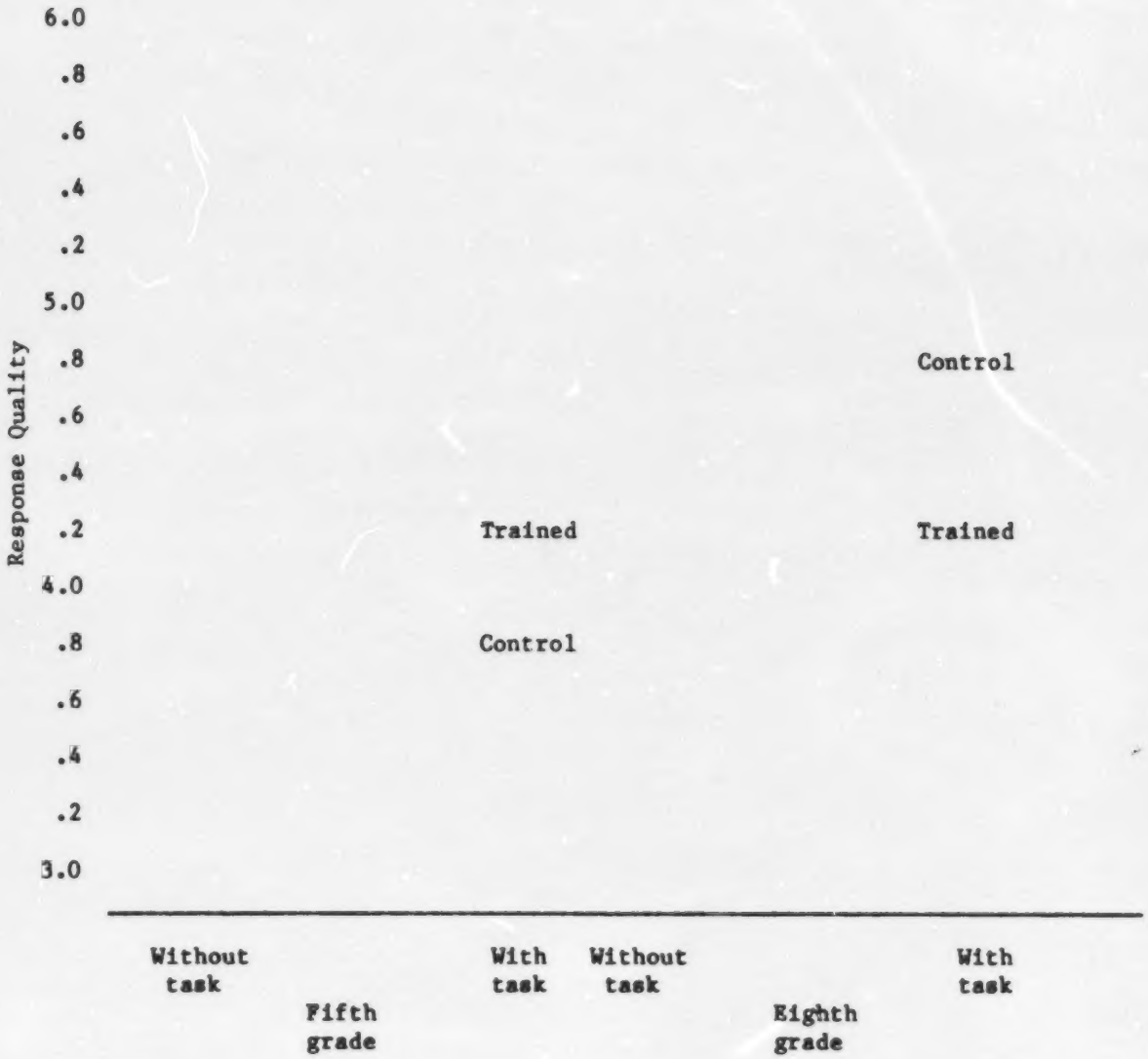

Figure 3. Response quality on repeated measures of ANOVA: condition x grade x task, Experiment 3.

most helpful in sensitizing students to the task demands of implicit or inferential (M Trained = 4.18; M Control = 3.23) questions than for text explicit questions (M Trained = 3.38; M Control = 3.78). This is consistent with the fact that the students have much more exposure to and practice on text based and explicit questions (Guszak, 1967; Hare & Pulliam, 1980), than on implicit or knowledge based ones.

General Discussion

The findings are applicable to three general issues: (1) the effect of training on students' sensitivity to the task demands of questions, (2) the effect of training on the quality of students' responses, and (3) the amount of training sufficient for improvement in both sensitivity to task demands of questions and response quality.

The findings across the three studies suggest that training consistently enhances sensitivity to the task demands of comprehension questions, particularly when those questions require drawing inferences or integrating across textual information. That is, children's ability to correctly identify question-answer relationships improved as a result of training or orientation, depending upon grade and ability levels, and was particularly effective for enhancing recognition of text-implicit relationships.

Further, training enhances the quality of students' responses, most notably under transfer conditions in which students are not cued by, nor required to respond, using the question-answer-relationship task. When both trained and control students are cued by the task, their performance levels vary as a function of age and ability. It may be that this specific finding reflects a developmental curve such that with the youngest students, the longer training period is useful, but having to use the question-answer-requirement task in addition to just answering the questions may have been

more than they were capable of doing. With the middle range of students, the training time may be shortened, and the use of the task prompts them to higher performance levels. With the oldest students in this studies, the training period may be reduced still further, and the use of the task becomes counter-productive.

More specifically, younger students require a longer and more intensive training period than do older students. This can be seen in the gradually decreasing amount of training required as students' age increases, with the minimal training of a brief orientation facilitative in eighth grade, a three day orientation being adequate in the sixth, and a longer (up to 8 weeks) training period facilitating performance of fourth and fifth graders. The important point to note here is that more is not unconditionally better.

It has been suggested that it is important for means or strategies to be used as ends in and of themselves before they are used as means in the service of some higher goal (Smirnov & Zinchenko, 1969). Yet once a strategy is learned as an end, a longer training program may create a sufficiently negative attitude such that performance levels when using the strategy as a means may actually be reduced. This has important implications for classroom instruction. There is often a tendency to think "When in doubt, practice more." The findings of these studies suggest that it is critical to consider carefully the amount of exposure and practice appropriate at a given grade level. While additional practice can be a valuable tool to lead students to the point of overlearning and eventually automaticity, teachers must use practice in such a way that their students' attitude towards using the strategy does not undermine their willingness to employ it when it is reasonable to do so.

References

Bock, R. D. (1975). Multivariate statistical method in behavioral research. New York: McGraw-Hill.

Garner, R., Wagoner, S., & Smith, T. (1983). Reading Research Quarterly, 18 (4), 439-447.

Guszak, F. J. (1967). Teacher questioning and reading. The Reading Teacher, 21, 227-234.

Hare, V., & Pulliam, C. A. (1980). Teacher questioning: A verification and an extension. Journal of Reading Behavior, 12, 69-72.

Hill, F. (1981). Principles of learning. Palo Alto, CA: Mayfield.

Mead, G. H. (1934). Mind, self, and society. Chicago: University of Chicago Press.

Pearson, P. D., & Johnson, D. D. (1978). Teaching reading comprehension. New York: Holt, Rinehart, & Winston.

Raphael, T. E., & McKinney, J. (in press). An examination of 5th and 8th grade children's question answering behavior: An instructional study in metacognition, Journal of Reading Behavior.

Raphael, T. E., & Pearson, P. D. (1982, March). Metacognitive training in question-answering strategies (Report No. 238). Champaign, IL: Center for the Study of Reading, University of Illinois.

Raphael, T. E., Winograd, P., & Pearson, P. D. (1980). Strategies children use when answering questions. In M. Kamil & A. J. Moe (Eds.), Perspectives on reading research and instruction. Washington, D.C.: National Reading Conference.

Raphael, T. E., Wonnacott, C. A., & Pearson, P. D. (1983, July). Metacognitive training in question answer relationships: Implementation in a 4th grade developmental reading program (Report No. 284). Champaign, IL: Center for the Study of Reading, University of Illinois.

Rosenthal, T. L., & Zimmerman, B. J. (1978). Social learning and cognition. New York: Academic Press.

Smirnov, A. A., & Zinchenko, P. I. (1969). Problems in the psychology of memory. In M. Cole & I. Maltzman (Eds.), A handbook of contemporary Soviet psychology. New York: Basic Books.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Wertsch, J. W. (1977). Metacognition and adult-child interaction. Unpublished paper, Northwestern University.